

February 21, 2002

Dr. Vijay Jain, Element Manager
Corrosion Science and Process Engineering
Center for Nuclear Waste Regulatory Analyses
6220 Culebra Road, Building 189
San Antonio, TX 78238-5166

SUBJECT: ACCEPTANCE OF INTERMEDIATE MILESTONE 01402.571.210,
"EVALUATION OF ANALOGS FOR THE PERFORMANCE ASSESSMENT OF
HIGH-LEVEL WASTE CONTAINER MATERIALS"

Dear Dr. Jain:

The Container Life and Source Term (CLST) staff have reviewed the Center for Nuclear Waste Regulatory Analyses (CNWRA) report, "Evaluation of Analogs for the Performance Assessment of High-Level Waste Container Materials," submitted to me along with your letter dated January 30, 2002. Your report summarizes existing relevant analog data and evidences in increasing the confidence in conceptual models of corrosion processes.

The CNWRA report is acceptable and fulfills the requirements set forth in the FY 2002 Operations Plans for the CLST Key Technical Issues. However, the report is subject to clarifications as stated in the enclosure before it is placed in the Public Document Room. If you or the authors of this report have any questions, please contact me at (301) 415-5812.

Sincerely,

/RA/

Tae M. Ahn
Program Element Manger
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: NRC Reviewers' Comments

cc: J. Linehan
B. Meehan

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- 2) This document is related to the HLW program. It is related to HLW, it should not be placed in the LSS. TMA 2/21/02

REVIEWERS' COMMENTS

GENERAL COMMENTS

(1) DOE's analogue studies are considered to provide little information on long-term corrosion process (EXE. SUMM. third paragraph; and Sec. 1.2). It is unclear more specifically why DOE's work is improper. The expectation from analogue studies would be broader (e.g., validation of modern corrosion theories). Another reviewer stated:

" --- the discussion of josephinite being unconstrained geologically is bit weak. See, for instance, <http://www.geo.cornell.edu/geology/faculty/Bird.html> for the latest (Spring 2001) on the occurrence of josephinite and it's constraints on formation and its occurrence."

(2) Exact analogues and environments do not exist. Nor do we predict deterministically the corrosion performance for longer than 10,000 years. The report presents many data bases and evidences that modern corrosion theories could be validated partially (qualitatively) in making best judgments (reasonable assurance) for the long-term corrosion behavior over 10,000 years. Examples include evaluations of Delhi Pillar, void formation in Josephenite, congruent dissolution in meteorites, and high chloride concentration in localized attacks. It would be more valuable if the report emphasizes the validity of modern theories. Overly pessimistic statements are shown in - the second paragraph in EXE. SUMM; - the last sentence of the second paragraph in INTRDUCT; and - the last two sentences in SUMM. Another reviewer commented in a slightly different language:

"pg. 2, last para in Section 1, the use of analogs is too narrowly defined by the authors. The technical basis for models can be supported by analogs [63.114(g)]. This basis should not be considered to be only the exact values used in an abstracted model. The technical basis should also include the justification for the approach. For instance, the same approach can be used for prediction of corrosion for a variety of metals. Comparison of predictions of less passive metals via the abstracted model to laboratory results would lend support to the modeling approach used for more passive metals. In essence you want to show that the model approach can be used to successfully predict the behavior of the overall process."

SPECIFIC COMMENTS

(1) In ABSTRACT, clarify "the performance confirmation code" in the last sentence.

(2) A paper in the symposium, Cadarache, France, November 26 to 29, 2001, shows the distribution of the corrosion rate of iron objects. Most (frequent) data show 0.1 to 10 mm/1000 years. The second paragraph in page 13 appears to include all extremes.

(3) Is there evidence that analogue studies would be "persuasive to the public" (the second paragraph in INTRDUCT) ?

(4) pg 1, paragraph 1, last sentence, don't cite acceptance criteria in the CLST IRSR, but use the regulatory requirements in Part 63 [63.114(g)]. Acceptance criteria in previous IRSRs are no longer the relevant regulatory framework (YMRP is and it is based on Part 63).

Enclosure

(5)

- pg 8, 2nd para, 3rd sentence, Olivine [iron silicate] is not a low temperature phase, and it is non-metallic and thus is not strictly subject to oxidation. It is either relict "contamination" of the meteorite or part of the "substrate". Further description of the occurrence of olivine (is it in the corrosion pits and cracks or on the surface of the meteorite?) is suggested. Moreover, olivine only forms at high-temperature and extremely reducing conditions. Finally, weathering of olivine is slower than oxidation of the metal, thus it more likely to be a relict from the oxidation process. Suggest you insert [iron silicate] after olivine to make it clear it is non-metallic.
- pg 15, acknowledge that "fayalite" is olivine. perhaps [the Fe-end member olivine which is an iron-magnesium silicate].
- pg 22, tantalum and niobium (columbium), and titanium are discussed as minor constituents, yet Table 4-1 has a column for Co (cobalt) and nothing for tantalum. Should the Co column be Ta? If not then the discussion in the text should address the role, if any, of Co (cobalt).

(6)

- pg 23 the mass/mass unit conversion to English units goes to mass/volume. (that is g/kg gets converted to lb/ft³). should be mass to mass.
- pg 24, there is a misplaced period in the first full sentence.